DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
Permit Application Analysis
AP-17066

September 8, 2015

NAME OF FIRM: Koch Exploration Company, LLC

MAILING ADDRESS: 950 17th Street, Suite 1900
Denver, CO 80202

CONTACT INFORMATION: Jordan Radin, Compliance Manager

TYPE OF OPERATION: Well Completions/Re-Completions

LOCATION: ` **Concentrated Development Area**

REVIEWER: Heather Bleile, Air Quality Engineer

PURPOSE OF APPLICATION: Per the requirements in the Chapter 6, Section 2 Oil and Gas Production Facilities Permitting Guidance, revised September 2013, Koch Exploration Company, LLC has applied for an Air Quality permit to conduct well completion/re-completion activities in the area known as The Concentrated Development Area (CDA) by using Best Management Practices to meet Best Available Control Requirements to reduce to the extent practicable emissions of regulated pollutants associated with these activities. The CDA is defined by seven counties: Carbon, Fremont, Lincoln, Natrona, Sweetwater, Sublette and Uinta.

PROCESS DESCRIPTION: Newly drilled wells and wells being recompleted generally require perforating and hydraulic stimulation (hydraulic fracturing) of the producing intervals in order to produce at economic rates. For the purpose of this permit the hydraulic stimulation of wells, along with the recovery and handling of the fracturing and completion fluids and hydrocarbons, is referred to as well completion operations.

Wells may be completed in single or multiple stages. During the fracturing stages, fluids containing proppant are pumped at high pressure down the wellbore, through perforated casing and into the reservoir rock to form cracks. After sufficient quantities of proppant have been pumped, the well is flushed with a less viscous fluid, or gel, and shut in for a short period of time. Added chemicals along with high downhole temperatures and pressures cause the gel to break down to a watery consistency. The well is opened up and the "broken" gel flows back from the well, leaving proppant behind in the fractures to provide pathways for hydrocarbons to move from the formation into the well.

The frac fluids are flowed back from the well to a surface pit until the flow is free of proppant. Once the flow stream is free of proppant, the next stage is perforated, another frac is pumped and the processes are repeated until all stages are fractured.

After all stages have been fractured continuous flowback of well fluids begins in order to "clean out" the well bore and reduce back pressure on the producing formations. At this stage it is important the fluids be flowed back as quickly as possible to avoid damaging the new wellbore. Initially, water containing residual proppant, reservoir solids and diesel fuel which may be used as an additive to the completion fluids is recovered. As flowback operations continue the ratio of gas to water in the returning fluids increases.

When enough gas is present in the flowback fluids the mixture is ignited at a flare pit. This is done for safety reasons and to evaporate the flowback liquids. Smoke and steam resulting from flaring are the result of incomplete combustion due to the presence of water and hydrocarbon liquids in the flowback stream.

Inert nitrogen (N_2) and carbon dioxide (CO_2) are sometimes added to "energize" the frac job by increasing flowback pressures. These inert gasses will not burn and their presence in the flowback gas will lower its BTU content.

Once a new well bore is "cleaned out" the well stream is tied into permanent surface production equipment for separation and sales.

EMISSIONS: Regulated air pollutants released to the atmosphere during flowback and completion operations are volatile organic compounds (VOC), hazardous air pollutants (HAP), nitrogen oxides (NO_X) and carbon monoxide (CO).

VOCs and HAPs are constituents of hydrocarbon compounds, excluding methane (C_1) and ethane (C_2). HAPs associated with hydrocarbons are n-hexane (n-C_6) and the B-TEX constituents; benzene, toluene, ethyl-benzene and xylene. Sources of VOC and HAP emissions are vented gas, gas released from hydrocarbon liquids (oil, condensate and diesel) and incomplete combustion.

NO_x and CO are byproducts of the combustion of hydrocarbons.

For estimating VOC, HAP, NO_X and CO emissions associated with well completion operations the Division has developed a spreadsheet using mass balance equations to calculate emissions in tons of pollutant generated per MMCF of gas vented or flared and per barrel of hydrocarbon liquids vented or flared. Input for the spreadsheet includes the volumes of liquids and gasses vented or flared and the associated VOC and HAP weight percents.

For NO_X and CO from the combustion of natural gas, condensate and diesel, EPA AP-42 emission factors were used. Emission factors are not available for all fluids and liquids therefore best fit factors were chosen based on known properties of the fluids.

The spreadsheets are made available on the Division's website or may be obtained upon request.

BEST AVAILABLE CONTROL TECHNOLOGY (BACT): The Air Quality Division considers the use of four-phase separation or green completion equipment as representing BACT for eliminating ninety percent of the VOC and HAP emissions associated with the flaring and venting of hydrocarbon fluids recovered during completion operations. It is recognized the ninety percent level of elimination is not achievable under all circumstances; therefore, the Division requires Best Management Practices to minimize emissions of regulated air pollutants associated with flaring and venting to the extent practicable.

Specialized four-phase separation equipment is manufactured to endure highly erosive conditions associated with producing high volume, high pressure completion fluids and is used unless specific well or infrastructure conditions preclude its use.

When using this equipment flowback fluids from each stage of a completion are routed to a pit or temporary tanks until combustible gas is detected in the fluids. At this point the fluids are routed to the sand trap portion of the four-phase separator where sand laden fluids are captured. The de-sanded fluids are then routed to the three-phase portion of the separator for separation of oil or condensate, water and gas. From here the gas phase is routed through a dehydration unit, then into a sales or gas collection system. The condensate or oil and the water are routed to storage tanks.

The sand traps must be designed to handle the maximum expected working pressure and the separation equipment must have ample flow capacity for expected gas and liquid volumes.

Certain conditions must exist in order to avoid flaring the recovered gas:

1) The gas must be salable.
2) There must be a connection to a gas collection system or sales line.
3) The flowing pressure of the recovered gas must exceed the collection system pressure.

Circumstances and conditions which may require flaring are:

Safety:
During times when large slugs of proppant are flowed back along with gas and fluids, it may be necessary to flare gas to prevent plugging of separation equipment.

High surface flowing pressures may restrict flow from the well. Restricted flow may hinder coiled tubing operations, increasing the risk of failure or buckled coiled tubing and the well stream must be flared and/or vented.

Completion foremen onsite have the discretion to determine the safety of any operation. Completion fluids will be diverted to surface pits if the operation of separation equipment is believed to be unsafe.

Pressure:
When flowing surface pressure at the well is less than sales line or collection system pressure, gas cannot flow to sales and will be flared.

Pipeline Connections at Wildcat or Exploratory Wells:
When no pipeline connection is in place, gas sales during completion operations can not occur. Pipeline connections may be lacking when new wells are drilled far from existing operations. These wells are classified as step-out, wildcat or exploratory.

Mechanical:
Breakdown of separators, line heaters or other equipment or plugging of equipment by solids or hydrates may prevent flowback to sales.

N_2 or CO_2 content of flow back gas:
The owners of gas gathering systems require certain conditions be met before gas is allowed to enter their systems. Most commonly, the concentrations of N_2 and CO_2 must not exceed certain percentages.

Circumstances considered unacceptable by the Division for sending gas to flare during completions are:

1) Lack of a pipeline connection due to reasons other than wildcat, exploratory or step-out well classification;
2) Inadequate water disposal capacity;
3) Undersized flow back equipment; and
4) Lack of flow back equipment or lack of personnel.

As required under WAQSR Chapter 3, Section 2, visible emissions associated with any flaring of the completion fluids shall be limited to twenty percent opacity as determined by 40 CFR part 60, appendix A, Method 9.

This permit includes monitoring, recordkeeping and reporting requirements which are intended to document the conditions necessary for using Green Completion practices and to ensure the implementation and adequacy of Best Management Practices. There will be ongoing Division review of the records submitted in accordance with this permit and of records submitted by other companies performing permitted well completions.

MONITORING: The proposed monitoring requirements will serve as the basis for reports which will demonstrate and document compliance or noncompliance with the conditions of this permit and will be used to summarize and quantify emissions associated with individual well completions.

The gas pipeline operator serving an area establishes salable gas quality and will not accept more than very small percentages of CO_2 or N_2. Therefore the CO_2 and N_2 content of flowback gas must be monitored to demonstrate gas salability.

Monitoring of flowing well and pipeline pressures will demonstrate when there is ample flowing well pressure to exceed the pressure of a gas collection system.

In order to complete the Well Completions Spreadsheet described under the EMISSIONS section of this analysis, liquid and vapor volumes and compositions of completion fluids recovered must be monitored.

RECORDKEEPING: Records of all monitored parameters and conditions and descriptions of circumstances requiring flaring and venting of completion fluids must be kept, on a well by well basis, and made available for Division review. Unless requested by the Division, there will be no requirement to submit these records on any regular basis.

NOTIFICATION: In order for Division personnel to have the option to observe completion activities, advance notification of the anticipated activities will be required. The Division will require notification of each well completion/re-completion activity at least fifteen (15) days prior to the commencement of the activity.

REPORTING: Within ninety (90) days of the First Date of Production for a newly completed/re-completed well, the Well Completion Spreadsheet summarizing total emissions of VOC, HAP, NO_X and CO occurring during the completion/re-completion activity and a summary of all circumstances and conditions which precluded the sale of flowback gas during the activity must be submitted to the Division. The Division will review the reports to ensure Best Management Practices are adequate and will compare the reports with those submitted by other operators.

To aid the Division in gauging the effectiveness of Best Management Practices, the reports shall include total volumes of hydrocarbon completion fluids recovered (BBL, MMCF) and the percentages of each flared, vented and sold.

PROPOSED PERMIT CONDITIONS: The Division proposes to issue an Air Quality Permit to Koch Exploration Company, LLC for well completion and re-completion operations within the Concentrated Development Areas with the following conditions.

1. Authorized representatives of the Division of Air Quality be given permission to enter and inspect any property, premise or place on or at which an air pollution source is located or is being installed for the purpose of investigating actual or potential sources of air pollution and for determining compliance or non-compliance with any rule, regulation, standard, permit or order.

2. All substantive commitments and descriptions set forth in the application for this permit, unless superseded by a specific condition of this permit, are incorporated herein by this reference and are enforceable as a condition of this permit.

3. Well Completion Emission Reports required by this permit shall be submitted to the O&G Permitting Engineer, 152 North Durbin Street, Suite 100, Casper, WY 82601 or may be submitted electronically. All other notifications, reports and correspondence required by this permit shall be submitted to the appropriate District Engineer.

   District 2 Engineer (Carbon and Natrona Counties), 152 North Durbin Street, Suite 100, Casper, WY 82601.

   District 4 Engineer (Fremont and Lincoln Counties), 510 Meadowview Drive, Lander, WY 82520.

   District 5 Engineer (Sweetwater, Sublette and Uinta Counties), 510 Meadowview Drive, Lander, WY 82520.

4. Emissions of volatile organic compounds (VOC) and hazardous air pollutants (HAP) associated with the flaring and venting of gas associated with well completion and re-completion activities shall be eliminated to the extent practicable by routing the gas into a gas sales line or collection system.

5. Circumstances unacceptable for sending gas to flare during completions are:

   A. Lack of pipeline connection due to reasons other than wildcat, exploratory or step-out well classification;

   B. Inadequate liquids disposal or storage capacity (use of flaring to evaporate flowback liquids);

   C. Undersized flow back equipment, lack of flow back equipment or lack of flowback equipment operating personnel.

6. The opacity of visible emissions associated with the flaring of hydrocarbon fluids associated with completion and re-completion activities shall be limited to twenty percent (20%) as determined by 40 CFR part 60, appendix A, Method 9.

7. This permit shall become effective for all well completion and re-completion activities commencing after issuance of this permit.

8. The Division shall reopen and revise this permit, as necessary, to add or delete requirements should the Division determine that:

   A. The practical application of the terms and conditions of the permit are unfeasible or fail to achieve the intent of the permit, or;

   B. The monitoring, recordkeeping, notification, or reporting requirements are inadequate to assure compliance with applicable requirements.

MONITORING

9. The hydrocarbon composition of gas recovered during completion and re-completion activities shall be sufficiently monitored in order to establish and verify salability or non-salability of the gas.

10. During flow back of completion and re-completion fluids, well pressure, operating pressure of surface separation equipment and sales or gathering pipeline pressure shall be monitored on no less than an hourly basis.

RECORDKEEPING

11. Records identifying and summarizing total volumes of hydrocarbon liquids (BBL) and natural gas (MMCF) recovered (flared, vented, stored in tanks, pits, trucks or other containment, or sold to gathering lines, storage or containment vessels or trucks) from the well bore during completion/re-completion activities shall be maintained on a per well basis. The records shall include summaries of associated operating pressures of the well and any surface equipment used to separate, store or collect the fluids and gas during recovery.

12. Records summarizing total tons of VOC, total HAPs, NO_X and CO emissions associated with the flaring and venting of hydrocarbon fluids, as recorded under condition eleven (11), shall be maintained for each completion and re-completion activity on a per well basis. The Division's Well Completion Emission Spreadsheet shall be used to generate the estimates of these emissions.

13. When specific operational circumstances require flaring or venting of hydrocarbon fluids associated with well completion or re-completion activities, records shall be maintained describing times, durations and causes of the events and circumstances requiring the flaring on a per well basis.

14. All records required under this permit shall be kept for a period of at least five (5) years and shall be made available to the Division upon request.

NOTIFICATION

15. The Division shall be notified of each well completion and re-completion activity at least fifteen (15) days prior to the commencement of the activity. The notification shall be submitted by mail or electronic mail to the appropriate district engineer (see condition three (3) above) and shall include:

    A. Location name and legal description;

    B. Anticipated start and finish dates.

REPORTING

16. Within ninety (90) days of the First Date of Production, defined as the date of commingled production when producing zones are commingled and sufficiently tested and product is flowing from all completed zones through permanent production and sales equipment, the permittee shall submit to the Division for each completed/re-completed well:

    A. A summary of the total volumes of hydrocarbon liquids (BBL) and natural gas (MMCF) recovered (flared, vented, stored in tanks, pits, trucks or other containment, or sold to gathering lines, storage or containment vessels or trucks) from the well bore during the completion or re-completion. The summary shall include percentages of total hydrocarbon liquids and gasses flared and vented to the atmosphere.

    B. The completed Well Completion Emission Spreadsheet described under condition twelve (12) of this permit.

September 8, 2015

Permit Application Analysis

Steve: _____

Cole/Andrew: _____

Company: Koch Exploration Company, LLC

Facility: Well Completions in CDA

Application #: AP-17066

Comments:

NSR Tracking Info
Publish Date: _____
End Date: _____
News Paper: _____
Initial Invoice: Yes ☐ No ☐ Faxed: ☐
Initial Invoice Paid _____